

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No.: 10/066,638

REMARKS

Preliminarily, Applicants file a Notice of Appeal concurrently herewith to maintain pendency of the application and to avoid the expensive third month extension of time fee. If the application is not in condition for allowance upon consideration of the Amendment and remarks submitted herewith, the undersigned respectfully requests the favor of an interview with the Examiner prior to filing a RCE.

Claims 57-60 are allowed; claim 21 is objected to as being allowable if rewritten in independent form; and claims 16-20, 22, 23 and 61-65 stand rejected over prior art.

Claim 21 has been rewritten in independent form as new claim 66. Claim 21 has been canceled. Claim 16 has been amended to delete "of said specific component" so as to conform with a previous amendment identifying the specific component as NO_x.

Entry of the amendments is respectfully requested.

Review and reconsideration on the merits are requested.

Claims 16-20, 22, 23 and 61-65 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kato et al. (SAE paper no. 970,858, also called Kato '858) in view of either GB 2,288,873 A or U.S. Patent 6,071,393 to Oshima et al. The Examiner relies on each of GB '873 and/or Oshima et al. as teaching use of a first oxygen pump cell in a two-chamber NO_x sensor to detect the concentration of oxygen in addition to determining NO_x concentration with a second pump cell. The reason for rejection was that it would have been obvious to modify the sensor of Kato '858 to include measurement of oxygen concentration in the first measurement

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chamber as taught by either of GB '873 or Oshima et al. (in order to extend the utility of the NOx sensor).

Applicants traverse, and respectfully request the Examiner to reconsider for the following reasons.

1. Oshima et al disqualified as prior art under § 103(c):

The present application and U.S. Patent 6,071,393 to Oshima et al were, at the time the present invention was made, owned by, or subject to an obligation of assignment to, the same person. Therefore, Oshima et al based on an application filed May 30, 1997 and issued on June 6, 2000 is available as prior art under § 102(e)(2) but under no other subsection of § 102, and is therefore disqualified as prior art for use in an obviousness rejection under § 102(e)/103(a) under § 103(c).

Applicants further submit herewith the verified English translation of Japanese Patent Application No. 9-264972, to thereby perfect their claim to foreign priority. The September 11, 1997 filing date of Japanese Patent Application No. 9-264972 antedates the five Japanese patent applications from which Oshima et al claims benefit, each laid-open subsequent to September 11, 1997. Japanese Patent Application No. 9-264972 among the four applications from which Applicants claim priority contains the subject matter of the present claims (calibration of detection output).

2. Kato '858 does not disclose sensor calibration as claimed:

Applicants respectfully disagree with the Examiner's reasoning as set forth in a previous Office Action. Kato '858 does not disclose calibrating a sensor by determining a "zero point"

(1) in atmosphere, or (2) upon cutting fuel supply, or (3) upon setting a rich air-to-fuel ratio, or (4) under certain driving conditions. Instead, Kato merely teaches that linearity of sensor response is only minimally dependent on temperature.

3. GB '873 does not cure the deficiencies of Kato '858:

The Examiner relied on GB '873 as teaching the use of a first oxygen pump cell and a two-chamber NOx sensor to detect the concentration of oxygen in addition to determining NOx concentration with the second pumping cell. However, this point alone cannot be the basis for an obviousness rejection under § 103(a). Namely, although GB '873 teaches that oxygen and NOx are measured stepwise in the first chamber and the second chamber, respectively, GB '873 never teaches calibrating a detection output of the NOx sensor based on the detected oxygen concentration. Neither does Kato '858.

4. Patentability of claims 16, 20 and 61:

Present claim 16 sets forth as follows:

calibrating a detection output of the NOx sensor by determining a zero point, which indicates a zero concentration of NOx, based on a detection output of the NOx sensor when the detected oxygen concentration assumes a value substantially the same as that in atmosphere, and

determining the NOx concentration after the detection output has been calibrated.

This specific feature of the invention is essential for calibrating the NOx sensor, in that the calibration can be carried out even during operation of the NOx sensor.

The Examiner has never pointed out where GB '873 discloses or suggests calibration of the NOx sensor. GB '873 never even contemplates the necessity of zero-point calibration of the NOx sensor. GB '873 only teaches that the concentrations of two gases (oxygen and NOx) can

be measured by a two-chamber sensor by applying the stepwise detection (measurement) of oxygen (first) and NO (second).

Likewise, even if Kato '858 is considered to disclose NOx sensor calibration by plotting sensor response as a function of NOx concentration including points close to 0 ppm NOx, there is no disclosure of calibrating the detection output when the detected oxygen concentration assumes a value substantially the same as that in atmosphere.

Therefore, the combination of Kato '858 and GB '873 fails to teach each and every limitation of present claim 16, and for this reason alone it is respectfully submitted that claim 16 and claims 19, 20 and 61 are patentable over the cited prior art.

Additionally, it is respectfully submitted that there is nothing in the prior art which teaches or suggests the desirability of detecting oxygen concentration in the first measurement chamber, and then calibrating a detection output when the detected oxygen concentration assumes any particular value, let alone a value substantially the same as that in the atmosphere. For this additional reason, it is respectfully submitted that claim 16 is patentable over the combination of Kato '858 and GB '873.

5. Patentability of claim 17:

With respect to claim 17, there is nothing in the prior art which teaches calibrating a detection output upon cutting fuel supply to the internal combustion engine so as to set the NOx concentration in gas introduced into the gas sensor substantially to zero or substantially the same level as the atmosphere. Certainly, there is no disclosure of such calibration in GB '873. Furthermore, even if one were to consider Fig. 4(b) of Kato '858 as suggesting calibration of the

NOx sensor, there is no data shown or disclosed on cutting fuel supply to the internal combustion engine as required by present claim 17. Operating under lean conditions is not the same as cutting fuel supply.

The pertinent limitations of claim 17 are shown below.

calibrating a detection output of the NOx gas sensor by determining a zero point, which indicates a zero concentration of the NOx, based on a detection output of the gas sensor obtained on cutting fuel supply to said internal combustion engine for setting the NOx concentration in the gas introduced into said gas sensors substantially to zero or to substantially the same level as the atmosphere; and

determining the NOx concentration after the detection output has been calibrated.

One other point needs to be made with respect to zero point determination.

Kato '858 simply plots sensor signal as a function of NOx concentration. There is some data in the vicinity of 0 ppm NOx. However, there is no disclosure of calibrating the detection output based on a zero point, namely, when setting NOx concentration in gas introduced into the gas sensor substantially to zero or substantially the same level as the atmosphere. Even if it would have been obvious to calibrate the NOx sensor based on the data plots of Kato '858, then that calibration would be a linear straight-line calibration as shown, and would have nothing to do with zero point calibration.

6. Patentability of claim 18:

Claim 18 requires:

calibrating a detection output of the gas sensor by determining a zero point, which indicates zero concentration of the NOx, based on a detection output of the gas sensor obtained on setting a rich air-to-fuel ratio for said internal combustion engine to reduce the NOx and to set the NOx concentration in the gas

introduced into said gas sensor substantially to zero or to substantially the same level as the atmosphere.

There is nothing in GB '873 which teaches calibration, let alone calibrating a detection output of the gas sensor by determining a zero point, let alone calibrating based on a detection output obtained on setting a rich air-to-fuel-ratio so as to reduce NO_x concentration substantially to zero or to substantially the same level as the atmosphere. Fig. 4(b) of Kato '858 shows a plot of sensor signal as a function of NO_x concentration when the engine is run under rich conditions. If any calibration is suggested at all, it is a straight-line calibration through the data points and has nothing to do with zero point calibration as required by claim 18.

7. Patentability of claims 22 and 23:

Claims 22 and 23 are patentable for at least the same reasons that claim 16 is patentable over the prior art. Similar to claim 16, claims 22 and 23 likewise require detecting oxygen concentration in a first measurement chamber, and calibrating a detection output of the NO_x sensor when the detected oxygen concentration assumes a value substantially the same level as that in the atmosphere.

As stated in the Office Action dated October 24, 2003, the Examiner considered certain claims to be allowable for the reason that:

The prior art does not disclose calibrating the zero point while the air-to-fuel ratio is temporarily set to a rich side for cleaning NO_x occluded in said NO_x occlusion catalyst.

This feature is similar to that of the limitation of claim 18 which requires calibrating based on a detection output of the gas sensor obtained on setting a rich air-to-fuel ratio for the

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internal combustion engine. Thus, it is respectfully submitted that at least claim 18 is patentable for the same reasons that claim 57 is patentable over the prior art.

Withdrawal of the foregoing rejection and allowance of claims 16-20, 22, 23 and 57-66 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

Respectfully submitted,



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